Future Technologies and Developments In Sonar Systems For Conventional Submarines

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19 April 2016, FCCI - New Delhi

... a sound decision
To Set the Context
Challenges to Overcome

Environment
- complex acoustic conditions
- biological noise
- high shipping densities

Operations
- networked operations
- high endurance
- less energy consumption

Human Factor
- reduced crew strength
- varying training levels
ISUS100 for Submarines
Superior System Performance for Complex Conditions

- Large Acoustic Aperture
- Long-Range Sonar Sensors
  - Expanded Flank Array
  - Flank Array
  - Towed Array with Winch and Shape Estimator

- Forward Looking Active Sonar (FLAS)
  - Mine Avoidance Mode
  - Forward Looking Mode
  - Safety Surfacing

- Passive Ranging Sonars
  - Advanced Ranging Sonar (as an option to EFAS)

- Medium Frequency Surveillance Sonar
  - Extended Conformal / Cylindrical Array
  - Vertical Beamforming
Multiple Additional Benefits
Expanded Flank Array Sonar

Features of the Expanded Flank Array Sonar (EFAS)

• Extension of the frequency range up to 4.8 kHz
• Improved directivity index due to higher frequency
• Improved target separation performance due to higher frequency
• Suppression of own noise by use of damping and shielding materials
• Effective flow noise damping by a hydro dynamically optimised sonar dome
Multiple Additional Benefits

EFAS Sea Trial Results- on 212A class submarine

**Screenshot from MFCC**
- EFAS in upper detection display
- CAS in lower detection display
- Superior detection performance
- Operationally applicable
Multiple Additional Benefits

Passive Ranging Principles – PRS vs. ARS
Enter The Airspace With A Towed Array
Passive Aircraft Detection

Future Functions

- Detect threats (helicopters / fixed wing aircraft)
- Generate target parameters (missile engagement)

Complete and full automatic passive aircraft detection:

- Narrow band processing for required frequencies
- Detection of targets with Multi-Hypotheses-Tracker
- Classification of aircraft / no aircraft
- Estimation of the target position
- Classification of aircraft type by fundamental frequency
Discover the Undiscovered
Improving Passive Sonar Detection Performance

Adaptive Beamforming Algorithms
- Estimation of beamformer parameters in real time from the stave data of the array (‘adaptive’)
- Computationally demanding compared to Delay-Sum beamformer

Features of adaptive beamforming
- High target separation capabilities
- Capability to detect very weak targets
- Robust schemes available
- Extended conformal & flank arrays
Discover the Undiscovered

Comparison DSBF vs. ABF: Sea Data EFAS - DSBF BDT 1
Minimum Effort – Maximum Output
Sonar Track Manager (SOTRAM)

- automatic track setup
- Automatic surveillance of track quality
- Automatic closing of tracks which have become unsafe

- „One Target, one Track“
- Change of track history possible

- Less displays
- Simplified operation
Someone is switching on the light— be the first and open your eyes.

Bistatic Sonar

Future Functions

- Evaluation of received target echoes within bi- & multistatic anti submarine warfare scenarios
- Operation in cooperative & non cooperative environments
- Displays range and bearing of contacts in PPI plot
**Safety First!**

**Multipurpose Forward Looking Active Sonar Setup**

**Transmission Concept**

- Application of single frequency / high bandwidth concept
- Centre frequency of 50 kHz represents optimum balance between
  - Detection ranges against small targets (mines)
  - Detection ranges against large targets (submarines)
- Forward looking performance
- Low probability of intercept
- Basis for MOAS and FLS functions
- Safety Surfacing
Safety First!

Mine & Obstacle Avoidance Sonar (MOAS)

Applicable for detection of
- floating mines
- moored mines
- obstacles
- small submarines

Additional Features
- Depth classification
- Automatic tracking
- Automatic alarm
- Automatic collision avoidance course proposals
- Horizontal detection sector: 120°
- Vertical detection sector: 60°
Safety First!
Forward Looking Sonar (FLS)

Features

• generates visual representation of sea bottom profile in forward direction
• applicable as a navigation and safe surfacing aid
• Horizontal detection sector: 120°
• Vertical detection sector: 60°
ISUS100 - A Considerable Step Forward in Evolution
The system solution for conventional submarines

- Improved sonar sensor performance for complex submarine missions
- Sea proven as well as innovative technology
- Minimum operator workload and maximum performance
- Optimum balance between computational power and energy consumption / low physical space occupancy
- Technology and service support can be provided to IN through our subsidiary ATLAS India
ISUS100

A Considerable Step Forward in Evolution
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